

Claims

1. Method for heating by means of a gaseous medium comprising steam, said steam being produced from water, energy for heating the water being provided by burning

5 a fuel, **characterised by** the steps of:

- mixing the steam with exhaust gas from combustion of said fuel; and
- using said mixture for heating purposes.

2. Method according to claim 1, **characterised in that** said fuel is a gaseous me-

10 dium, for example butane, propane, natural gas or the like, or a liquid medium, for example diesel, oil or the like, or a solid medium, for example coal, pellets, peat, oilshale, coke, wood or the like.

15 3. Method according to claim 1 or 2, **characterised by** the step of introducing said mixture into a cavity for heating.

4. Method according to claim 3, **characterised in that** said cavity constitutes any-one of the following: exhaust channel; tank; drainage system; chimney; boiler; pipe-line; oil container; oil well; oil shale; oilslick, oil tanks, ventilating duct, heat ex-changer system, preparation vessels, down pipe and spout, exhaust air system, cavity on fire, road culverts, street gullies, water and drainage pipes, bore holes, casting moulds, PVC pipes or the like.

20 25 5. Method according to any one of the preceding claims, **characterised by** the step of regulating the temperature of said mixture.

6. Method according to any one of claims 1, 2, 3 or 5, **characterised by** the steps of:

- exchanging heat between said mixture and cool water, such that the water is heated to a desired water or steam temperature and said mixture is cooled to the condensing temperature;
 - using the heated water for heating purposes; and
- 5 – reusing the condensed mixture to repeat the above steps.

7. Method according to claim 6, **characterised by** the further step of filtering the condensed mixture prior to reusing it;

10 8. Method for heating by means of a gaseous medium comprising steam, said steam being produced from water, energy for heating the water being provided by burning a fuel, **characterised by** the steps of:

- mixing the steam with exhaust gas from combustion of said fuel;
- exchanging heat between said mixture and cool water, such that the water is heated to a desired water or steam temperature and said mixture is cooled to the condensing temperature;
- using the heated water for heating purposes; and
- reusing the condensed mixture to repeat the above steps.

15 20 9. Method according to claim 8, **characterised by** the further step of filtering the condensed mixture prior to reusing it.

25 10. Method according to claim 8 or 9, **characterised by** the further step of supplying said hot water to buildings or the like for heating purposes.

11. Method according to anyone of claims 8-10, **characterised by** the further steps of:

- prior to supplying said heated water to buildings exchanging heat between the heated water and cool water such that the cool water is heated up to a desired tap

- water temperature for hot water and the heated water is cooled down slightly to a desired temperature for supplying radiator systems;
- supplying said hot tap water to the tap water system of buildings or the like and supplying said hot radiator water to the radiator system of said buildings; and
 - retrieving the cool return water from said buildings for exchanging of heat with the hot steam and exhaust gas mixture.

5 12. Method according to claim 8 or 9, **characterised by** the further step of introducing said steam into a steam turbine for the production of electricity;

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13. Method according to claim 8, 9 or 12, **characterised by** the further step of exchanging heat between steam from said turbine and cool water such that the steam is condensed to water and returning the water for exchanging of heat with the hot steam and exhaust gas mixture.

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14. Method for purifying gases, said gases comprising non-combusted gases and / or exhaust gases, **characterised by** the steps of:

- producing steam by heating water by means of burning a fuel;
- mixing the steam with exhaust gas from combustion of said fuel;
- mixing said gases with the steam and exhaust gas mixture;
- cooling the mixture to the condensation temperature; and
- filtering the liquid mixture.

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15. Method according to claim 14, **characterised by** the further step of collecting light impurities, for example CO₂.

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16. Use of steam produced according to any one of claims 1-5, for fire fighting.

17. Method for extinguishing fires in oil bore holes, **characterised by** the steps of:

- 30 – producing steam by heating water by means of burning a fuel;

- mixing the steam with exhaust gas from combustion of said fuel, said mixture preferably being dry and saturated and having a low pressure and a temperature of preferably 300 – 400°C;
- introducing the mixture into the bore hole to be mixed with inflammable gas;

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18. Method according to claim 17, **characterised by** the further step of introducing said mixture into the inflammable gas in a pulsed way

19. Device for heating by means of a gaseous medium comprising steam, said steam being produced from water, energy for heating the water being provided by burning a fuel, **characterised in** an arrangement (1, 1', 200) for mixing the steam with exhaust gas from combustion of said fuel.

20. Device according to claim 19, **characterised in that** said fuel is a gaseous medium, for example butane, propane, natural gas or the like, or a liquid medium, for example diesel, oil or the like, or a solid medium, for example coal, pellets, peat, oilshale, coke, wood or the like.

21. Device according to claim 19 or 20, **characterised by** means for introducing said mixture into a cavity for heating.

22. Device according to anyone of claims 19-21, **characterised in that** said cavity constitutes anyone of the following: exhaust channel; tank; drainage system; chimney; boiler; pipeline; oil container; oil well; oil shale; oilslick, oil tanks, ventilating duct, heat exchanger system, preparation vessels, down pipe and spout, exhaust air system, cavity on fire, road culverts, street gullies, water and drainage pipes, bore holes, casting moulds, PVC pipes or the like.

23. Device according to any one of claims 19-22, **characterised in a container** (2, 20), at least one pipe system (4, 23) arranged in said container (2, 20) for introduc-

ing water and for extracting steam from said container (2, 20) and a burner (3) for heating water and steam in said pipe system and means for extracting exhaust gases from combustion by means of said burner (3) and means for mixing said steam and said exhaust gases.

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24. Device according to claim 23, **characterised in** a pressure chamber from which steam is extracted.

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25. Device according to claim 23 or 24, **characterised in** a cavity (13, 26) in which said steam and said exhaust gases are mixed.

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26. Device according to anyone of claims 23-25, **characterised in** an injection chamber (8) arranged upstream in relation to the mixing chamber (13) comprising a separate cavity (8a) for said steam and a separate cavity (8b) for said exhaust gases, said steam being heatable by said exhaust gases in said injection chamber (13).

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27. Device according to claim 26, **characterised in** the injection chamber (8) having an inner cavity (8a) for said steam and an outer cavity (8b) for said exhaust gases, said cavities preferably being concentrically arranged.

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28. Device according to claims 26 or 27, **characterised in** that said injection chamber (8) comprises means for extracting steam unmixed with exhaust gases.

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29. Device according to anyone of claims 23-28, **characterised in** that steam is extracted via a safety valve (9) and a vent passage (10).

30. Device according to any one of claims 19-29, **characterised in** means for regulating the temperature of the mixture.

31. System for heating by means of a gaseous medium comprising steam, said steam being produced from water, energy for heating the water being provided by burning a fuel, **characterised in that** said system (50) comprises an arrangement (1, 1', 200) for mixing the steam with exhaust gas from combustion of said fuel, a heat exchange-
5 ing means (51), for example a heat exchanger, into which said mixture is arranged to be introduced, condensation means for condensing the mixture, and means for re-using the liquid mixture.

10 32. System according to claim 31, **characterised in that** said means for re-using the liquid mixture comprises a pipe configuration (59) for transporting the liquid mixture back to said arrangement (1, 1', 200).

15 33. System according to claim 31 or 32, **characterised in that** the system further comprises circulation means (63) for example a circulation pump connected to said pipe configuration (59).

20 34. System according to anyone of claims 31-33, **characterised in that** said fuel is a gaseous medium, for example butane, propane, natural gas or the like, or a liquid medium, for example diesel, oil or the like, or a solid medium, for example coal, pellets, peat, oilshale, coke, wood or the like.

25 35. System according to anyone of claims 31-34, **characterised in that** said system further comprises filtering means (60, 61) for filtering said mixture arranged down-stream of said condensation means

36. System according to claim 35, **characterised in that** said system further com-
25 prises an accumulator tank (62) for accumulating the filtered water arranged down-
stream of the filtering means (61).

37. System according to claim 35 or 36, **characterised in that** said filtering means comprises a water filter (61), for example active coal, for filtering heavy impurities in the liquid mixture arranged in said pipe configuration (59) downstream of said condensation means, and a collecting vessel (60) for collecting light impurities, for example CO₂.

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38. System according to anyone of claims 31-37, **characterised in that** said heat exchanging means (51) comprises an opening (52a) connected to the opening (17) of said arrangement, an inlet (54) for introducing tap water, an outlet (55) for extracting hot water or steam and a drainage opening (58a) for draining the condensed mixture, connected to a condensation pipe (57b) and preferably an opening (52b) for extracting light impurities.

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39. System according anyone of claims 31-38, **characterised in that** said arrangement (1, 1', 200) is intended to comprise any kind of unit, device, system, process plant, factory, engine or the like intended for burning a fuel, for example a gas burner, an oil burner, a turbine, a combustion engine, piston engine, an incinerator or the like.

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40. System according to anyone of claims 31-39, **characterised in that** said system further comprises at least one second heat exchanging means (64), for example a central boiler plant or a heat exchanger, into which hot water from the outlet (55) of the heat exchanger (51) is arranged to be introduced and exchange of heat between said hot water and cool water is arranged to be achieved.

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41. System according to claim 40, **characterised in that** said second heat exchanging means (64) comprises a first opening (55b) connected to the outlet (55) of said heat exchanger (51) intended for receiving hot water from said outlet (55), an inlet (65) intended for introducing cool tap water, an outlet (66) intended for extracting hot water, said outlet preferably being connected to the tap water system of at least

one building via a pipe configuration (66b) intended for transporting hot tap water to said system, and a second opening (68) intended for extracting said received hot water, said second opening (68) preferably being connected to the radiator system (68b) of said at least one building

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42. System according to anyone of claims 31-39, **characterised in that** said system further comprises at least one steam turbine (70) into which hot steam from the outlet (55) of the heat exchanger (51) is arranged to be introduced, said turbine (70) being intended for the production of electricity (72).

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43. System according to claim 42, **characterised in that** said system further comprises a third heat exchanging means (71), for example a heat exchanger, into which steam from the turbine (70) is arranged to be introduced and exchange of heat between said steam and cool water is arranged to be achieved, such that said steam is cooled down to water, and is arranged to be returned to the first heat exchanger (51).

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44. Use of the system according to anyone of claims 31-39, for heating up buildings

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45. Use of the system according to anyone of claims 31-39, for supplying steam to a steam turbine for the production of electricity.

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46. System for purifying gases, said gases comprising non-combusted gases and / or exhaust gases, **characterised in that** said system comprises; an arrangement (1, 1', 200) for mixing steam, said steam being produced from water, energy for heating the water being intended to be provided by burning a fuel, with exhaust gas from combustion of said fuel; means (96) for mixing said gases with the steam and exhaust gas mixture (100); condensation means (87) for condensing the mixture (150), filtering means (90, 91) arranged downstream of said condensation means for filtering said liquid mixture; means for re-using the purified water.

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47. System according to claim 46, **characterised in that** said means for re-using the liquid mixture comprises a pipe configuration (93) for transporting said mixture, connected to said arrangement (1, 1', 200).

5 48., System according to claim 46 or 47, **characterised in that** the system further comprises circulation means (92), for example a circulation pump, connected to said pipe configuration.

10 49. System according to anyone of claims 47-49, **characterised in that** said filtering means comprises a water filter (91), for example active coal, for filtering heavy impurities in the liquid mixture arranged in said pipe configuration (93) downstream of said condensation means (87), and a collecting vessel (90) for collecting light impurities, for example CO₂, preferably arranged above the level of the condensation means.

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20 50. System according to anyone of claims 46-49, **characterised in that** said arrangement (1, 1', 200) is intended to comprise any kind of unit, device, system, process plant, factory, engine or the like (81) intended for burning a fuel, for example a gas burner, an oil burner, a turbine, a combustion engine, piston engine, an incinerator or the like.

25 51. System according to anyone of claims 46-50, **characterised in that** said system comprises a unit (85) which is intended to comprise any kind of device, system, process plant, factory, engine or the like discharging non-combusted hot or cold gases, said gases being arranged to be introduced into a chamber (96) in which they are arranged to be mixed with said steam and exhaust gas mixture (100).

30 52. System for extinguishing fires in oil bore holes or the like, said holes being created with oil bores by oil drilling, **characterised in that** said system (110) comprises; an arrangement (1, 1', 200) for mixing steam, said steam being produced

from water, energy for heating the water being intended to be provided by burning a fuel, with exhaust gas from combustion of said fuel, said mixture (100) being intended to be introduced into said oil bore hole when a fire occurs in said hole.

5 53. System according to claim 52, **characterised in that** said system further comprises a pipe configuration (111) intended to be closely received in an oil bore hole, said pipe configuration (111) comprising a substantially cylindrical outer casing (113) and an inner casing (112), between which casings a cavity (116) is formed, into which cavity (116) the mixture (100) is intended to be introduced by means of pressure, said inner casing (112) comprising openings (117) axially provided along the pipe configuration (111).

10 54. System according to claims 52 or 53, **characterised in that** the inner casing (112) of the pipe configuration (111) form chambers (114) axially provided along the pipe configuration (111), said chambers (114) being axially connected to each other via openings (115).

15 55. System according anyone of claims 52-54, **characterised in that** said arrangement (1, 1', 200) is intended to comprise any kind of unit, device, system, process plant, factory, engine or the like intended for burning a fuel, for example a gas burner, an oil burner, a turbine, a combustion engine, piston engine, an incinerator or the like.,

20 56. Device for improving the handling by extinguishing fires in oil bore holes or the like, **characterised in a** pipe configuration (111) intended to be closely received in an oil bore hole, said pipe configuration (111) comprising a substantially cylindrical outer casing (113) and an inner casing (112), between which casings a cavity (116) is formed, into which cavity (116) a gaseous medium is intended to be introduced, said inner casing (112) comprising openings (117) axially provided along the pipe configuration (111).

57. Device according to claims 56, **characterised in that** the inner casing (112) of the pipe configuration (111) form chambers (114) axially provided along the pipe configuration (111), said chambers (114) being axially connected to each other via openings (115).

58. Device according to claims 56 or 57, **characterised in that** the gaseous medium is a mixture of steam and exhaust gas from combustion of a fuel.